**CS173 Intermediate Computer Science**

**Reading 11 Questions**

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**Read Chapter 10.7 - 10.8 on pointers.**

**Answer the following questions:**

(1) Define pointer.

A variable that contains the addresses or locations of other variables.

(2) What is the addressing operator (or address-of operator)? Give an example of its use.

An address-of operator is a special operator that allows us to assign a memory address of a variable to another variable.

For example, we can make a variable a1 point to a variable b1 by the statement a1 = &b1; with the unary & operator.

(3) What is the dereferencing operator? Give an example of its use.

A dereferencing operator is a special operator that allows us to access a variable that a pointer points to.

For example, we can assign a new value to a variable b1 by the statement \*a1 = 16;

(4) Consider the program below. Guess what is printed as the output. Then type in the program and run it. After you run it, give the actual output of the program.

#include <iostream>

using namespace std;

int main ( void )

{

int x1 = 10;

int x2 = 20;

int x3 = 100;

int \*p1 = &x1;

int \*p2 = &x2;

int \*p3 = &x3;

\*p1 = 5;

\*p2 = \*p3;

p3 = p1;

cout << "Line 1: " << x1 << endl;

cout << "Line 2: " << \*p2 << endl;

cout << "Line 3: " << \*p3 << endl;

return 0;

}

YOUR GUESS:

Line 1: 5

Line 2: 10

Line 3: 5

ACTUAL OUTPUT:

Line 1: 5

Line 2: 10

Line 3: 5

If your guess differs from the actual output, see if you can identify why.

(5) Explain the difference between *direct addressing* and *indirect addressing*. What role do pointers play in this distinction?

Indirect addressing goes through two steps by first using a pointer that gives the location of the variable while direct addressing access a variable in one step by using the variable name. In this distinction, pointers work as a connecting bridge to access the desired variable.

(6) (a)What is a reference type?

A reference type is a simple data type consisting of an unbounded set of values, each of which is the address of a variable of a given type.

(b) Explain how a reference type is similar to and different from a pointer type.

Similar to a pointer type, reference type contains the addresses of other variables.

The difference is that the dereferencing and address-of operators (\* and &) are not used to dereference reference variables. Also, the value of a reference variable cannot be reassigned after being initialized.

(c) Give an example segment of code that creates a reference to an integer variable and then uses that reference to change the value of the original integer. Do the same functionality using a pointer data type. Follow the example code on Page 563.

int a1 = 16;

int& refA1 = a1;

refA1 = 32;

int b1 = 16;

int\* ptrB1 = &b1;

\*ptrB1 = 32;

(7) The ampersand & has several uses in C++. List four different uses of the ampersand and give an example of each use.

Address-of operation: Used when giving the memory address of that variable.

Bitwise AND operation: Used when performing a bitwise AND operation to the variables.

Logical AND operation: Used between two boolean expressions for performing a logical AND operation.

Data type (specifically, a reference type): Used when declaring a reference variable.